YEMEL'YANOV, V.S., inzhener.

Changing hammer mills in electric power stations over to compensate impact hammers. Elek. sta. 28 no.6:18-19 Je '57. (MLRA 10:8)
(Coal, Pulverized) (Crushing machinery)

YEMEL'YANOV, V.S., inzh.

New methodological manual on the theoretical mechanics ("Method of solving problems on theoretical mechanics" by M.A. Misiurev. Reviewed by V.S. Emel'ianov). Izv.vys.ucheb.zav.; gor.zhur. no.7:116 '58. (MIRA 12:3)

(Mechanics) (Misiurev, M.A.)

YEMEL'YANOV, V.S., inzh.

Steady motion of the hammer on a hammer mill. Izv.vys.uchab. zav.; gor.zhur. no.6:53-59 '59. (MIRA 13:4)

1. Sverdlovskiy gornyy institut imeni V.V.Vakhrusheva. Rekomendovana kafedroy teoreticheskoy mekhaniki.
(Crushing machinery)

7

SOLNTSEV, M.P., dotsent; YEMEL'YANOV, V.S., starshiy prepodavatel'

Theory of a two-rope grab-loader for loose, small-size materials. Izv. vys. ucheb. zav.; gor. zhur. no.9:125-132 '60. (MIRA 13:9)

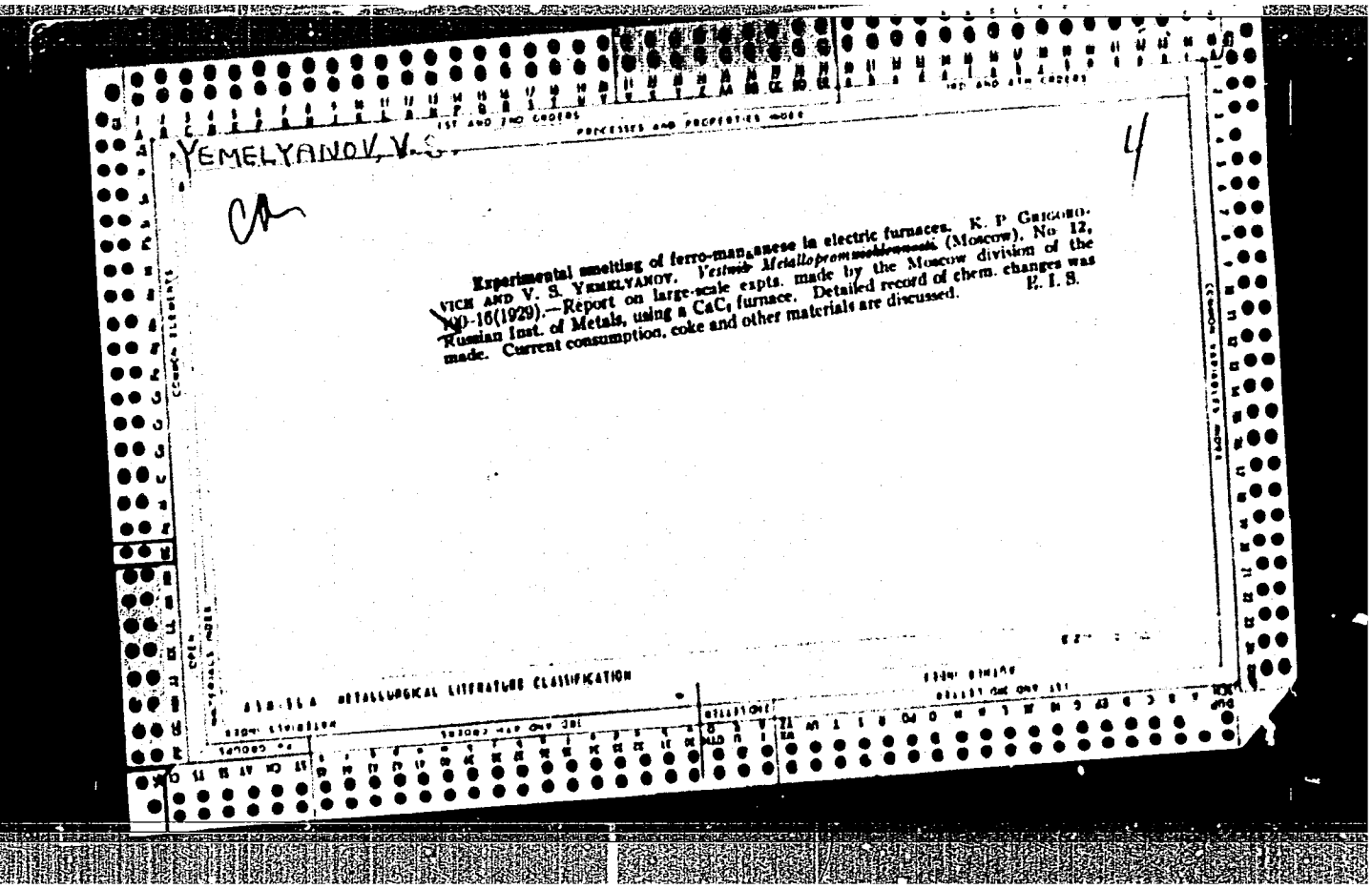
1. Sverdlovskiy gornyy institut im. V.V. Vakhrusheva. Rekomend. kafedroy prikladnoy mekhaniki.
(Ore handling--Equipment and supplies)

YEMEL'YANOV, V.S., starshiy prepodavatel'; VOLEGOV, A.V., inzh.

Analytical determination of the parameters of a centrifugal vibrating sorter. Izv.vys.ucheb.zav.; gor.zhur. no.3:143-148 '61. (MIRA 15:4)

1. Sverdlovskiy gornyy institut imeni V.V.Vakhrusheva; rekomendovana kafedroy obogashcheniya poleznykh iskopayemykh Sverdlovskogo gornogo instituta.

(Asbestos) (Sorting devices)



YEMELYANOV, V. S.

4

Experimental smelting of ferro-manganese in electric furnaces. K. P. Grigorovich and V. S. Yemelyanov. *Vestnik Metallopromyshlennosti* (Moscow), No. 12, No. 10(1929).—Report on large-scale expts. made by the Moscow division of the Russian Inst. of Metals, using a CaC_2 furnace. Detailed record of chem. changes was made. Current consumption, coke and other materials are discussed. E. I. S.

YEMEL'YANOV, V. S.

Udalenie rzhavchiny i preduprezhdenie eia. Sverdlovsk, Mashgiz, 1946.

Removal and prevention of corrosion.

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congress, 1953.

YEMEL'YANOV, V. (S.)

"Atomic Methods in Industrial Progress," Izvestiya, No.118, 20 May 55 - page 2

Translation TI 159351

YEMELYANOV, V. S.

Associate Mbr, AS USSR

"Radioactive Isotopes"

NOVY MIR, August, 1955

YEMEL'YANOV, V. S.

AID P - 2868

Subject : USSR/Engineering

Card 1/1 Pub. 110-a - 1/16

Author : Yemel'yanov, V.S., Mem. Corr. Acad. of Sci. USSR

Title : Utilization of atomic energy for peace

Periodical : Teploenergetika, 10, 3-8, O 1955

Abstract : A popular review of the theories and development of nuclear physics. The Soviet atomic power plant operating on the fission of uranium-235 is mentioned. The path of future research is indicated and the difficulties encountered at present are explained. Possible utilization of radioactive waste necessitates further research. Material needed for the construction of atomic reactors is considered.

Institution : None

Submitted : No date

YEMEL'YANOV, V.S

AID P - 3880

Subject : USSR/Power Eng.

Card 1/1 Pub. 110-a - 1/17

Author : Yemel'yanov, V. S., Corr. Memb., Academy of Sciences, USSR

Title : Possible utilization of radioactive isotopes

Periodical : Teploenergetika, 11, 3-6, N 1955

Abstract : The article discusses in a very general way the means of possible utilization of radioactive isotopes in industry and agriculture and lists some fields where these processes are already being applied (textiles, foods, fertilizing, medicine, biochemical processes, etc.)

Institution : None

Submitted : No date

YEMELYANOV, V.S.

CARD 1 / 2 PA - 1604

SUBJECT USSR / PHYSICS
AUTHOR EMELYANOV,V.S., BYSTROV,P.D., EVSTYUKHIN,A.I.
TITLE An Investigation of the Iodide Method of Refining Zirkonium.
PERIODICAL Atomnaja Energija, 1, fasc. 1, 43-51 (1956)
Issued: 3 / 1956

The present investigation served the purpose of explaining the principles of the process of refining as well as of problems of practical interests. Tests were carried out in small glass- and quartz vessels under 10^{-4} mm vacuum, in which glowing tungsten wires fastened by molybdenum holders were used as seperators. Temperature was measured by means of pyrometers. Besides contradictory statements made in literature concerning the influence exercised by the temperature of the wire on the course taken by reaction, a considerable dependence was found to exist within the range of operation of from 1200 to 1500° C. In contrast to statements made by other authors, who believe in a slight increase of dissociation constants within the range above 1450° C, it is assumed that ZrJ_4-partial pressure near the wire cannot increase infinitely because the partial pressures satisfy the equation $P_J - P_{ZrJ_4} = P_{total}$.

The influence exercised by the quantity of iodide on reaction velocity: In the case of small quantities, 3 - 5 mg/50 g Zr, reaction is very short, apparently because of the formation of low iodides. The curve shows a distinct maximum at 12 mg/1000 cm^3 vessel volume.

Atomnaja Energija, 1, fasc. 1, 43-51 (1956) CARD 2 / 2 PA - 1604

For the dependence of the precipitation velocity on vessel temperature (and thus on the temperature of the metal) different authors give different data. It was found that, on the assumption that the temperature of the ZrJ_4 is constant, and assuming an optimum steam pressure, the temperature of the vessel can vary between 235 and 700° C without reaction velocity being influenced.

In the course of the investigation of the problem as to the existence of a second maximum above 420° C the following two cases were distinguished:
1. If Zr is fine, i.e. if its surface is large, low iodides will form, and at higher temperatures tetraiodide will be formed which leads to a 2. maximum.

2. In the case of small quantities of the metal in large pieces, there will always be a surplus of ZrJ_4 which determines the vapor pressure and thus the reaction velocity, the optimum of which is at about 235-240° C.
This hypothesis was confirmed by a further experiment in the course of which vapor pressure was measured in the vessel.

INSTITUTION:

YEMEL'YANOV, V.S.

C.

USSR/ Inorganic Chemistry. Complex Compounds

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11437

Author : Yemel'yanov V.S., Bystrov P.D., Yevstyudhin A.I.

Title : Investigation of Iodide Method of Zirconium Refining. Communication 2. Lower Zirconium Iodides and Effect of Tetraiodide Pressure on Rate of Deposition of the Metal

Orig Pub : Atom. energiya, 1956, No 3, 122-131

Abstract : In continuation of previous work (Part 1, RZhKhim, 1956, 68069) an investigation was made of the influence of lower iodides (LI) and vapor pressure of ZrI_4, on the process rate of zirconium refining by the iodide method. Following refining LI are found on the surface of the raw metal in the form of black, black-brown, occasionally bluish-black bloom. The deposit approximates ZrI_3 in composition at reaction flask temperatures of 300-500°, and that of ZrI_2 at 620°. Combining of ZrI_4 at LI at the surface has as a final result, according to the authors, elimination of excess ZrI_4 on prolonged iodizing and consequently a decrease of its pressure in the reaction flask, which in turn changes the rate. The authors believe that other important factors which affect the rate of the

1/2

C.

USSR/ Inorganic Chemistry. Complex Compounds

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11437

process at pressures of ZrI_4 > 0.2 - 0.3 mm Hg., are inhibition of diffusion process of metal transfer, due to lowering of diffusion coefficient of gaseous phase components on increase in pressure, and formation of LI at surface of incandescent Zr rod.

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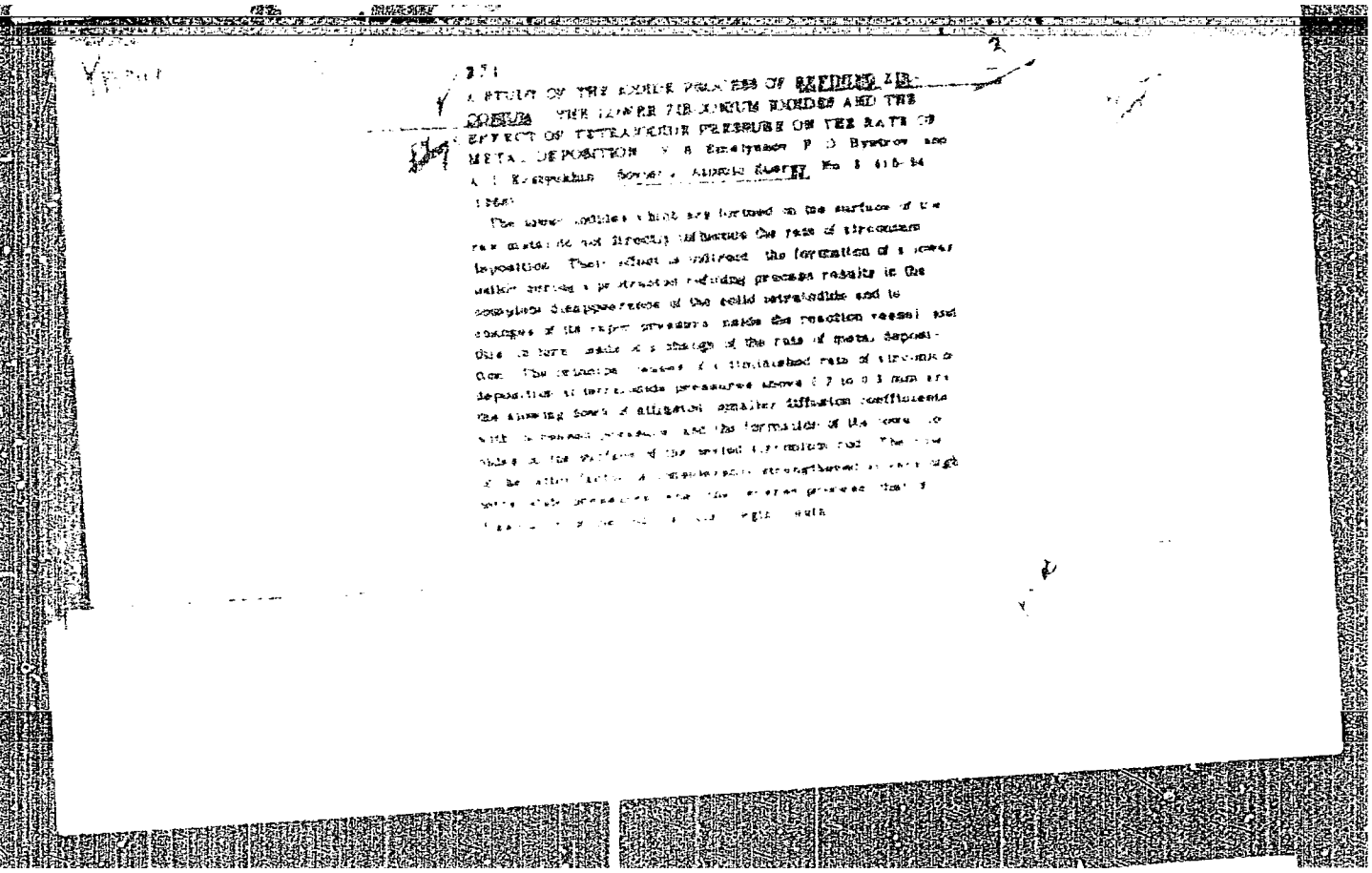

YEMEL'YANOV, V. S.

CARD 1 / 2 PA - 1519

SUBJECT USSR / PHYSICS
AUTHOR EMEL'JANOV,V.S., EVSTJUCHIN,A.I.
TITLE The Investigation of Systems of Fused Salts on the Basis of Thorium Fluoride. Note I: Investigation of the System ThF_4 - Na Cl - KCl.

PERIODICAL Atomnaja Energija, 1, fasc. 4, 107-112 (1956)
Issued: 19.10.1956

The system NaCl - KCl - ThF_4 and the systems NaCl - ThF_4 and KCl - ThF_4 therein contained are of importance for the selection of the electrolyte on the occasion of the winning of thorium by means of electrolysis. The main method employed by the authors for the investigation of these state diagrams was the thermal analysis (with automatic recording of the simple and differentiated curves) of the fused salts. As an auxiliary method they chose phase analysis by the direct comparison of the X-ray pictures obtained with those of pure raw materials: ThF_4, NaCl and KCl. Furthermore, microstructure analyses of the microsection surfaces of these salt alloys were carried out. Production and properties of the material examined are described. There follows the discussion of the investigation of the systems NaCl - ThF_4 and KCl - ThF_4.

Conclusions: The state diagram found here of the system NaCl - ThF_4 belongs to the diagrams of eutectic type with lacking displaceability of components in the solid state. The eutecticum is at 23 molecular percents ThF_4 and 712° C.

Atomnaja Energija, 1, fasc. 4, 107-112 (1956) CARD 2 / 2

The state diagram of the system KCl - ThF_4 is also of the eutectic type with the eutecticum at 23 molecular percents ThF_4 and 704° C. The components of this system are practically insoluble in the solid state.

On the occasion of the fusing of KCl and ThF_4 in the presence of oxigen or humidity, complex compounds of the type $K_xTh_yF_{x+4y}$ are produced, where x= 1, y = 2 or 6. Also these complex compounds with KCl give diagrams of the eutectic type.

In conclusion a polythermal section of the triple system NaCl - KCl - ThF_4 through (1 NaCl : 1KCl) - ThF_4 is constructed. On this section the lowest point of the line of eutectic crystallization is at about 40 weight percents ThF_4 (12,6 molecular percents) and 626° C.

INSTITUTION:

YEMEL'YANOV, V.S. YEMEL'YANOV, V.S.

AA - 1756

CARD 1 / 2

SUBJECT USSR / PHYSICS

AUTHOR EMEL'JANOV,V.S., EVSTJUCHIN,A.I.

TITLE The Investigation of Systems of Molten Salts on the Basis of Thorium Fluoride.

PERIODICAL Atomnaja Energija, 1, fasc.5, 80-85 (1956)

Issued: 1 / 1957

By means of thermographic, roentgenographic and other methods of analysis the state diagrams of the system NaF - ThF_4 with four chemical compounds (Na_4ThF_8; α-Na_2ThF_6, β-Na_2ThF_6, $NaThF_5$, $NaTh_2F_9$) and of the system Kf-ThF_4 with 6 chemical compounds (K_5ThF_9), K_3ThF_7, $K_3Th_2F_{11}$, $KThF_5$, KTh_2F_9, KTh_6F_{25}) are constructed.

Investigation of the system NaF -KF - ThF_4 and of the therein contained systems NaF-ThF_4, KF-ThF_4 was carried out in connection with the study of a multicomponent electrolyte which is formed on the occasion of the continuous electrolysis of the salts NaCl-KCl-ThF_4 by the accumulation of NaF and Kf. Investigation was carried out by the methods of thermal-, roentgen-phase- and chemical analysis. As initial material chemically pure NaF, KF and ThF_4 was used. The system KF-ThF_4 contains the chemical compounds K_3ThF_7, $KThF_5$ and $KThF_{13}$, which form 4 simple eutectic systems. Also the 6 chemical compounds contained in the system KF-ThF_4 are enumerated.

Investigation of the system NaF-ThF_4 was carried out on 35 alloys at intervals of from 2 to 2,5 Mol-percents of ThF_4 within the range of from 2 to 35 mol-per-

Atomnaja Energija, 1, fasc.5, 80-85 (1956) CARD 2 / 2

cents and with intervals of 3,5 mol-percents within the range of from 35 to 100 mol-percents. In the system $NaF-ThF_4$ there are 4 chemical compounds: Na_4ThF_8, Na_2ThF_4, $NaThF_5$ and $NaTh_2F_9$. Na_2ThF_6 exists in two modifications.

Investigation of the system $KF-ThF_4$ was carried out on more than 40 melts with intervals of 2-3 mol-percents ThF_4. This system is very complicated, it has 6 chemical compounds which are enumerated together with their domains of existence.

The system $NaF-KF-ThF_4$: The domain $NaF-Na_2ThF_6-KThF_5-KF$, which is of interest in connection with the electrolytic winning of thorium, was investigated. On the data obtained on this occasion this domain was triangulated for 6 trinary systems. Investigation confirmed the existence of a new compound (phase X) of the composition $NaK(ThF_6)$ with a noticeable homogeneity domain. A particularly important domain of solid solutions was noticed on the section $NaKThF_6-K_3Th_2F_{11}$.

The polythermal section of $NaF-KThF_5$. For the additional investigation of the compound $KNaThF_6$ a polythermal section of the system along the line $NaF-KThF_5$ was constructed. Results are shown in form of a diagram. At 665° C, $NaKThF_6$ decays after a peritectic reaction, and at 540° C it is subjected to a polymorphous transformation. The peritectic point on the horizontal of 655° C is about 63 mol-percents NaF. At 570° C and 31 mol-percents $KThF_5$ the eutecticum $NaKThF_6$ + NaF is found.

INSTITUTION:

YEMEL'YANOV, V.S.

YEMEL'YANOV, V.S., red.; YEVSTYUKHIN, A.I., doktor tekhn.nauk, red.; L'VOVA, N.M., red.; ERLEVA, M.A., tekhn.red.

[Purification of metals; a collection of translations] Metody polucheniia chistykh metallov; sbornik perevodov. Moskva, Izd-vo inostr.lit-ry, 1957. 384 p. (MIRA 11:1)

1. Chlen-korrespondent AN SSSR (for Yemel'yanov).
(Metallurgy)

SOV/137-58-10-20685

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 10, p 50 (USSR)

AUTHOR: Yemel'yanov, V.S.

TITLE: Modern Methods of Recovering Pure Metals for New Engineering Purposes (Sovremennyye metody polucheniya chistykh metallov dlya novoy tekhniki)

PERIODICAL: V sb.: Nekotoryye vopr. inzh. fiz. Nr 2. Moscow, 1957, pp 5-14

ABSTRACT: An examination is made of the properties of high-purity metals: Semiconductors, nuclear fuels, Al, Cr, Zr, Ti, etc., and data are presented on the methods by which they are recovered. It is noted that the methods of industrial recovery of high-purity metals yielding the best prospects are decomposition of halides, vacuum distillation, and floating-zone refining. Refractory metals are smelted by electric arc with consumable electrodes and by the use of cooled metal molds so as to prevent the introduction of impurities into the metals.

Ye.Z.

1. Metals--Recovery 2. Halides--Decomposition
3. Flotation 4. Vacuum systems--Applications

Card 1/1

SOV/137-58-9-18827

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 95 (USSR)

AUTHORS: Yemel'yanov, V.S., Bystrov, P.D., Yevstyukhin, A.I.

TITLE: An Iodide Method of Refining Zirconium. A Contribution to the Problem of the Relationship of Rate of Deposition of the Metal to the Temperature of an Incandescent Zirconium Filament (Iodidnyy metod rafinirovaniya tsirkoniya. K voprosu o zavisimosti skorosti otlozheniya metalla ot temperatury raskalennoy tsirkoniyevoy niti)

PERIODICAL: V sb.: Nekotoryye vopr. inzh. fiz. Nr 2. Moscow, 1957, pp 15-23

ABSTRACT: Taking the hypothesis that processes of diffusion are decisive in the kinetics of the process of the transfer of Zr to a central filament (F), it is shown that the rate of deposition of the Zr on the F is directly proportional to the pressure of free I near the surface of the F, and that this in turn determines the temperature of the F. Inasmuch as the vapor pressure of the I around the F cannot exceed the total pressure in the apparatus, which is governed by the wall temperature, the rate of deposition of Zr on the F ceases to increase with a further rise in F

Card 1/2

An Iodide Method of Refining Zirconium. (cont.)

temperature after the attainment of some specific F temperature which depends upon the total pressure in the apparatus. These concepts afford an explanation of the available experimental data of various authors on the dependence of the rate of Zr deposition upon an F on the temperature of that F. It is also shown that the quantity of Q_A introduced by Döring and Molière (J.H. Döring, K. Molière, Z. für Elektrochemie, 1952, Vol 56, Nr 4, p 403) in the equation $\log a = \text{const} - Q_A/RT_D$, where a is the rate of Zr deposition and T_D, the temperature of the F, is related to ΔH in the process of dissociation by the expression $Q_A = \Delta H/4$. If account be taken of the formation of lower Zr iodides on the surface of the F, the value of Q_A, it appears, is also dependent upon the vapor pressure of the ZrI_4.

V.M.

1. Zirconium--Processing 2. Filaments (Incandescent lamp)--Temperature factors
3. Zirconium--Electrodeposition 4. Mathematics

Card 2/2

PA - 2091

YEMEL'YANOV, V.S.

AUTHOR: EMEL'JANOV,V.S., GODIN,JU.G., EVSTJUCHIN,A.I.
TITLE: Investigation of the Zirconium-Tantalum.System.
PERIODICAL: Atomnaia Energiia, 1957, Vol 2, Nr 1, pp 42-47 (U.S.S.R.)
Received: 3 / 1957 Reviewed: 3 / 1957

ABSTRACT: This system was investigated by methods of metallography, thermal analysis, electric resistance, hardness, and the X-ray-phase anelysis, and the state diagram was constructed. The difficulties in producing zirconium-tantalum alloys were adjusted by smelting the corresponding samples in the electric arc oven MIFI-SM-3 with a coolable copper crucible. The samples were smelted in a pure argon atmosphere. The production of the samples from primary materials is described. The cast samples were homogenized by annealing at 1200°, then ground and dry-polished. Samples of non-annealed powder (which was taken from cast- and chilled alloys of different composition) were subjected to an X-ray phase analysis. The thermograms were recorded only up to 1000° by means of the recording KURNAKOV pyrometer. Determination of the solidus- and liquidus lines is then discussed.

Results of the investigation: The investigation of the microscopic structure of the cast samples proved the existence of a considerable domain of solid solutions of tantalum in zirconium, as well as of an eutecticum and of a domain of solid solutions

Card 1/2

Investigation of the Zirconium-Tantalum System. PA - 2051

of zirconium in tantalum. The X-ray-phase analysis proved the existence of only two phases in the system: an α-phase and a β-phase, i.e. a solid solution based on tantalum. The β-phase of zirconium could not be stabilized at room temperature. The eutecticum is about 1585±15° C and 34 atom percents of tantalum. The eutectic structure of such an alloy is shown in a diagram. The maximum of solubility of tantalum in β-zirconium amounts to 16 and 17% atom percents respectively in the case of metallographic determination. An eutectoidal disintegration was observed in alloys with some atom percents of tantalum. Various special cases of alloys are demonstrated in diagrams. According to the data of metallographic analysis the temperature of the eutectoidal disintegration amounts to 790±10° C, a fact which was confirmed by thermal analysis. The greatest solubility of tantalum in α-zirconium was insignificant; it is less than 0,22 atom percents of tantalum. Based on these investigations the state diagram of the system zirconium-tantalum was then constructed. In order to examine these state diagrams also the electric resistances of samples of the alloy were measured which were cast at 1200° and 770° C and then chilled. Finally, also the hardness of the aforementioned alloys was measured. Hardness increases if tantalum is added to zirconium.

ASSOCIATION: Not given.
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress
Card 2/2

PHASE I BOOK EXPLOITATION SOV/4926

Yemel'yanov, V. S., ed.

Kratkaya entsiklopediya "Atomnaya energiya" ("Atomic Energy"; a Concise Encyclopedia) [Moscow] Gos. nauchnoye izd-vo "Bol'shaya sovetskaya entsiklopediya" [1958] 610 p. 50,000 copies printed.

Members of Editorial Board: I. P. Bardin, A. P. Vinogradov, V. I. Gol'danskiy, I. V. Gulyakin, P. I. Dolin, D. V. Yefremov, A. K. Krasin, A. V. Lebedinskiy, A. L. Mints, A. N. Murin, V. E. Nize, I. I. Novikov, V. F. Semenov, and I. N. Sobolev; Scientific Eds.: G. Ya. Bakharovskiy, D. M. Berkovich, N. F. Danovskiy, N. N. Delone, M. A. Kon, V. N. Kopylov, Yu. B. Mandel'tsvayg, B. M. Milovidov, N. P. Mostovenko, P. A. Murinov, I. A. Polyakov, Z. P. Preobrazhenskaya, A. M. Rabinovich, S. M. Simkin, I. M. Skvortsov, P. V. Sysoyev, N. A. Shorin, G. I. Shreyberg, and R. Ya. Shteynman; Literary Ed.: L. S. Koval'skaya; Compiler of Bibliography: V. M. Pimenova; Tech. Ed.: S. D. Kosti.

PURPOSE: The encylopedia is intended for scientists, researchers, engineers, and students who deal with atomic energy.

Card 1/3

COVERAGE: This encyclopedia was prepared by the Glavnaya redaktsiya Bol'shoy Sovetskoy Entsiklopedii (Main Editorial Office of the Great Soviet Encyclopedia) in cooperation with the Glavnoye upravleniye po ispol'zovaniyu atomnoy energii pri Sovete Ministrov SSSR (Main Administration for the Utilization of Atomic Energy attached to the Council of Ministers USSR). The material contained in this encyclopedia was prepared by scientists and engineers of the following institutions and organizations: Pervaya atomnaya elektrostantsiya AN SSSR (First Atomic Power Plant AS USSR), Radiyevyy institut imeni V. G. Khlopina AN SSSR (Radium Institute imeni V. G. Khlopin, AS USSR), Institut geokhimii i analiticheskoy khimii AN SSSR (Institute of Geochemistry and Analytical Chemistry AS USSR), Vsesoyuznyy institut mineral'nogo syr'ya Ministerstva geologii i okhrany nedr SSSR (All-Union Institute of Mineral Raw Materials of the USSR Ministry of Geology and Preservation of Mineral Resources), Moskovskiy inzhenerno-fizicheskiy institut (Moscow Engineering Physics Institute), Moskovskaya sel'skokhozyaystvennaya akademiya imeni K. A. Timiryazeva (Moscow Agricultural Academy imeni K. A. Timiryazev), Moskovskiy gosudarstvennyy uni-

versitet imeni M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov), and Leningradskiy gosudarstvennyy universitet imeni A. A. Zhdanova (Leningrad State University imeni A. A. Zhdanov). The material is drawn from open Soviet and other sources listed in the bibliography. The authors and editors of the articles and the editors of the Great Soviet Encyclopedia who participated in this work are listed on page 611.

TABLE OF CONTENTS: None

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Card 3/3

YEMELYANOV, V. S.

"Binary and Ternary Alloys of Zirconium with Tantalum and Niobium",

by V. S. Yemelyanov, Y. G. Godin and A. I. Yevstyukhin.

Report presented at 2nd UN Atoms-for-Peace Conference, Geneva, 9-13 Sept 1958

YEMEL'YANOV, V. S.

AUTHORS: Yemel'yanov, V. S., Godin, Yu. G., Yevstyukhin, A. I. 89-2-8/35

TITLE: Study of the Zirconium Area of the Phase Diagram of Zr-Ta-Nb.

PERIODICAL: Atomnaya Energiya, 1958, Vol. 4, Nr 2, pp. 161-170 (USSR).

ABSTRACT: A study was made of the zirconium area of the ternary diagram Zr-Ta-Nb with phase field boundaries corresponding to 82% of Zr and a temperature of 1200°C, and of the system Zr-Nb. The study was carried out by the methods of metallographic, thermal and X-ray diffraction analysis. Five polythermal cross-sections passing through the apex of the zone were selected for the construction of the Zr area of the phase diagram; the cross sections had the ratio of

$$\frac{\%Nb}{\%Ta} = 0.2;\ 0.5;\ 1.0;\ 2.0;\ 5.0.$$

The following phase areas were established: a) two single-phase areas α and β ; b) three two-phase areas $\alpha+\beta$, $\beta+\gamma$, and $\alpha+\gamma$; c) one three-phase area $\alpha+\beta+\gamma$. The solubility of Ta and Nb in α-Zr in the system Zr-Ta-Nb is approximately 0.5%. Shifting of the phase areas $\alpha+\beta$ and $\beta+\gamma$ from Zr-Ta to Zr-Nb (to lower temperatures and higher Nb contents) was observed. The boundaries of the phase areas $\alpha+\gamma$ and $\alpha+\beta$

Card 1/2

89-2-8/35

Study of the Zirconium Area of the Phase Diagram of Zr-Ta-Nb.

are lowered from 790°C for Zr-Ta to 612°C for Zr-Nb. A binary eutectoid line which passes between the areas $\alpha+\beta$ and $\beta+\gamma$ shifts from Zr-Ta to Zr-Nb, i.e. to higher Nb-contents and lower temperatures. The solubility of Nb in α-Zr in the system Zr-Nb is approximately 0.5 wt.%. Eutectoid disintegration in the system Zr-Nb takes place at 612 $\pm$ 13°C. Addition of Nb to alloys in the system Zr-Ta shifts the maximum of martensinic transformation to the left and increases the stability of β-phase in annealed alloys at room temperatures.

SUBMITTED: April 10, 1957

AVAILABLE: Library of Congress

Card 2/2 1. Zirconium-X-ray diffraction analysis 2. Niobium 3. Tantalum
4. X-ray diffraction analysis-Applications

JEMELJANOV, V.S. [Yemelyanov, V.S.]; MEDONOS, S. [translator]

Future of nuclear engineering in the Soviet Union. Jaderna energie 4 no.11:318-321 N '58.

1. Vedouci Hlavni spravy pro vyuziti jaderne energie pri Rade ministru SSSR (for Jemeljanov).

SOV/89-5-3-1/15

AUTHOR: Yemel'yanov, V. S.

TITLE: Atomic Energy in the USSR in the Future (Budushcheye atomnoy energetiki v SSSR)

PERIODICAL: Atomnaya energiya, 1958, Vol. 5, Nr 3, pp. 217-222 (USSR)

ABSTRACT: The reserves of organic fuels of every kind available in the USSR are very considerable. Nevertheless, an extensive program for the establishment of nuclear power plants is at present being developed in order to gather experience for future power plants. It is furthermore intended to prove that atomic kWh are well able to compete with ordinary kWh. Near Voronezh a 420 megawatts atomic power plant is being built, in which two reactors, which are water-cooled and in which water is used as a moderator (100 atm), will be installed. Saturated steam of 29 atm is conveyed to the turbines. The fuel elements are made from uranium oxide. Enrichment amounts to 1,5% U^{235}. The second nuclear power plant of the same type will be established near Leningrad. As soon as sufficient experience will have been gathered by means of these reactors, steam will be produced in the reactors themselves. Near Ul'yanovsk on the Volga a boiling-

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water reactor with a power output of 50 MW is at present being built. The fuel elements used correspond to those used in the aforementioned plants. On the Volga a number of prototype power reactors is at present being built in order that experience can be gathered with various types of reactors. In the Ural a nuclear power plant with a 400 MW electric power output is being built, in which the steam is produced in the reactor itself and is conveyed straight to the turbine. Four reactors will be erected in this power plant, each of which will be connected by direct coupling with a 100 MW turbine. The reactor produces steam of 90 atm and having a temperature of from 480 to 500°C. The fuel elements of these reactors are exactly the same as those of the first Russian nuclear power plant. However, they are 6 m long, instead of 1.7 m as in the first plant. Also a reactor of 50 MW electric power output is being built on the Volga, in which sodium is used as a coolant. The reactor is intended to produce steam of 90 atm and 500° C. The pressure under which the coolant is intended to circulate in the reactor amounts to only 8 atm. The first reactor with fast neutrons (zero energy fast reactor) was put into operation in 1955. In February 1956 a 100 kW reactor for fast neutrons was put into operation. The fuel elements are made from plutonium and mercury is used as a coolant. In July 1958 a 5 MW reactor for fast neutrons was made critical. The active

zone consists of plutonium, and sodium is used as a coolant. The fast neutron flux in the reactor center attained 10^{15} n/cm^2.sec. For the purpose of investigating the resistance of the materials used in fuel elements a 50 MW reactor for epithermal neutrons is being built. Neutron flux will amount to 2.10^{15} n/cm^2.sec. A mobile nuclear power plant of 5 MW is under construction. The reactor is enclosed by a steel casing of 1 m diameter and 2,2 m height. As coolant and moderator water with 120 atmospheres excess pressure is used. A turbine for 20 atm and 280° C is connected in the secondary circuit. The reactor will begin to operate by the end of 1958 on the site of the first Russian nuclear power plant. Parallel with this work also investigations concerning fusion were continued on a large scale. Pictures of the "Alfa" device are shown, which is similar to the British "Zeta" machine. [illegible] figures.

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SOV/25-58-11-11/44

AUTHOR: Yemel'yanov, V.S., Corresponding Member of the USSR Academy of Sciences, Head of the Main Administration for the Use of Atomic Energy of the USSR Council of Ministers

TITLE: The Future of Atomic Power in the USSR (Budushcheye atomnoy energetiki v SSSR)

PERIODICAL: Nauka i zhizn', 1958, 25 Nr 11, pp 23-26 (USSR)

ABSTRACT: The author reviews the possibilities for the use of atomic energy in the USSR. He describes various atomic projects being carried out, for instance, an atomic power plant with a capacity of 420,000 kw is being built in the Voronezh Oblast', another one in the Leningrad Oblast', a reactor of the water-moderated type with boiling water, of an electric capacity up to 50,000 kw is under construction at the Volga in the Ul'yanov Oblast'. The Ural power plant will be equipped with four reactors, each of which will operate in a bloc system with a turbine capacity of 100,000 kw. Another atomic power plant of 2,000 kw capacity with mobile reactors and installations has just been built in the USSR. In 1956, Academician I.V. Kurchatov visited Harwell and spoke on the

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scientific results of studying the creation of thermo-nuclear reactions in gas discharge.
There is 1 photo.

ASSOCIATION: Akademiya nauk SSSR (USSR Academy of Sciences)
Glavnoye upravleniye po ispol'zovaniyu atomnoy energii pri Sovete Ministrov SSSR (Main Administration for the Use of Atomic Energy of the USSR Council of Ministers)

YEMEL'YANOV, V.S.

21(4) P. 2 PHASE I BOOK EXPLOITATION SOV/2583

International Conference on the Peaceful Uses of Atomic Engergy. 2nd, Geneva, 1958.

Doklady sovetskikh uchenykh; yadernyye reaktory i yadernaya energetika. (Reports of Soviet Scientists; Nuclear Reactors and Nuclear Power) Moscow, Atomizdat, 1959. 707 p. (Series: Its: Trudy, vol. 2) Errata slip inserted. 8,000 copies printed.

General Eds.: N.A. Dollezhal, Corresponding Member, USSR Academy of Sciences, A.K. Krasin, Doctor of Physical and Mathematical Sciences, A.I. Leypunskiy, Member, Ukrainian SSR Academy of Sciences, I.I. Novikov, Corresponding Member, USSR Academy of Sciences, and V.S. Fursov, Doctor of Physical and Mathematical Sciences; Ed.: A.F. Alyab'yev; Tech. Ed.: Ye. I. Mazel'.

PURPOSE: This book is intended for scientists and engineers engaged in reactor designing, as well as for professors and students of higher technical schools where reactor design is taught.

COVERAGE: This is the second volume of a six-volume collection on the peaceful

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use of atomic energy. The six volumes contain the reports presented by Soviet scientists at the Second International Conference on Peaceful Uses of Atomic Energy, held from September 1 to 13, 1958 in Geneva. Volume 2 consists of three parts. The first is devoted to atomic power plants under construction in the Soviet Union; the second to experimental and research reactors, the experiments carried out on them, and the work to improve them; and the third, which is predominantly theoretical, to problems of nuclear reactor physics and construction engineering. Yu. I. Koryakin is the science editor of this volume. See SOV/2081 for titles of all volumes of the set. References appear at the end of the articles.

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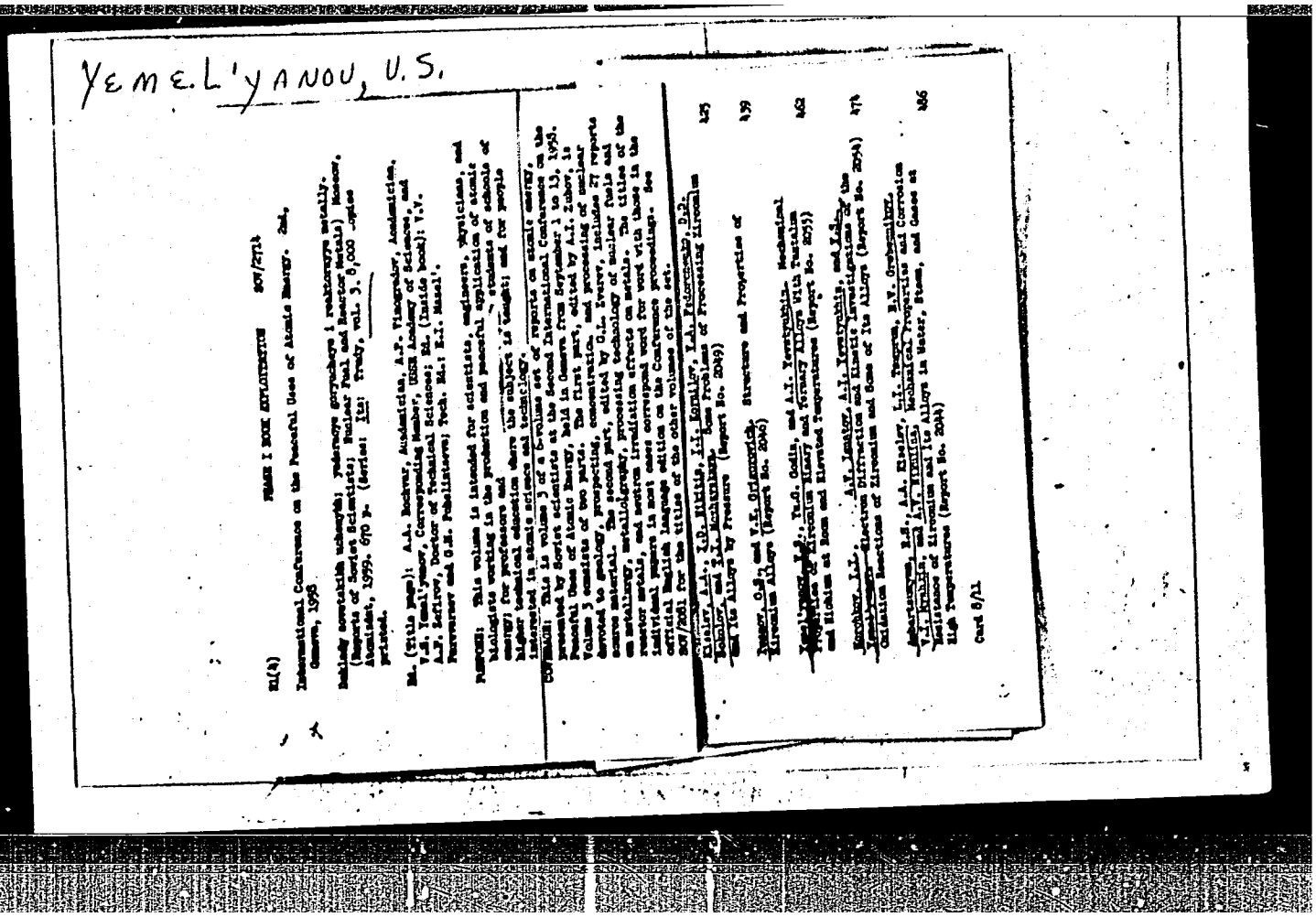

YEMEL'YANOV, U.S.

YEMEL'YANOV, V.S.

3(1) PHASE I BOOK EXPLOITATION SOV/2713

International Conference on the Peaceful Uses of Atomic Energy. 2nd, Geneva, 1958

Doklady sovetskikh uchenykh; polucheniye i primeneniye izotopov (Reports of Soviet Scientists; Production and Application of Isotopes) Moscow, Atomizdat, 1959. 388 p. (Series: Its: Trudy, vol. 6) 8,000 copies printed.

Eds. (Title page): G.V. Kurdyumov, Academician, and I.I. Novikov, Corresponding Member, USSR Academy of Sciences; Ed. (Inside book): Z.D. Andreyenko; Tech. Ed.: Z.D. Andreyenko.

PURPOSE: This book is intended for scientists, engineers, physicians, and biologists engaged in the production and application of atomic energy to peaceful uses; for professors and graduate and nongraduate students of higher technical schools where nuclear science is taught; and for the general public interested in atomic science and technology.

COVERAGE: This is volume 6 of a 6-volume set of reports delivered by Soviet scientists at the Second International Conference on the Peaceful Uses of Atomic Energy held in Geneva from September 1 to 13, 1958. Volume 6 contains 32 reports on: 1) modern methods for the production of stable radioactive isotopes and their labeled compounds, 2) research results obtained with the aid of isotopes in the field of chemistry, metallurgy, machine building, and agriculture, and 3) dosimetry of ionizing radiation. Volume 6 was edited by: S.V. Levinskiy, Candidate of Medical Sciences; V.I. Prusakov, Candidate of Chemical Sciences; and V.V. Selov, Candidate of Medical Sciences. See SOV/2081 for titles of volumes of the set. References appear at the end of the articles.

[redacted]

S/081/61/000/021/045/094
B150/B101

AUTHORS: Yevstyukhin, A. I., Yemel'yanov, V. S., Leont'yev, G. A.

TITLE: Investigation of the process of obtaining thorium by electrolysis

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 21, 1961, 296 - 297, abstract 21K158 (Sb. "Metallurgiya i. metalloved. chist. metallov." M., no. I, 1959, 7 - 35)

TEXT: By the electrolysis of the melt NaCl + KCl + ThF_4 it is possible to obtain high-purity thorium and to reduce the content of impurities of the rare-earth elements by 60 to 80 times in comparison with the content in the original ThF_4. By electrolyzing the melts with a solid cathode the crystals of the deposit are less contaminated by impurities than a deposit on a liquid cathode. The crystals are bigger than the crystals of the metal obtained by chemical methods. However, the deposit is never dense, which is connected with the considerable loss of the electrolyte included in the cathodic deposit. Consequently, the experiments were conducted in

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Investigation of the process of obtaining ...

a bath with an auto-compressing cathodic deposit, allowing considerable reduction of the content of the electrolyte in the deposit. At the beginning of the electrolysis, the melt contained (in % by weight): Th 12.5, Na 16.1, K 22.6, Cl. 44.7, F 3.8. The change in the composition of the electrolyte in the electrolysis was studied by chemical, thermal, and X-ray methods. As the electrolysis proceeds there is a continuous variation of composition of the electrolyte - an accumulation of fluorine in the form of NaF and KF. The ThF_4 added forms complexes of the type $NaKThF_6$, $Na[ThF_5]$, Na_2ThF_6, $K[ThF_5]$, $K_2[ThF_6]$. With the usual construction of cathode the deposit contains up to 75% of electrolyte. The metal yield is 30%. With auto-compressing cathodes the content of electrolyte falls to 50% and the metal yield increases to 75%. At a high content of Th in the electrolyte, the current yield increases, but at the same time the losses of Th increase owing to the removal of the electrolyte. The optimum concentration of Th in the electrolyte is 40 - 43 % by weight. With this, the current yield is 50 - 56%, and the content of coarsely disperse powder of Th is 2 - 2.3 times greater than the content of the "sludges" (finely disperse powder). The optimum volume concentration of

Investigation of the process of obtaining ...

current is 50 - 70 a per kg of electrolyte (D_c = 3 - 4 a/cm^2). At 680 to 700°C, the yield of metal reaches its maximum; with an increase of temperature the content of the finely disperse fraction increases. The reduction of D_c has a similar effect. Thermodynamic calculations show that the discharge of Na^+ or K^+ ions with subsequent reduction of thorium fluoride by the alkali metal is the initial process in the electrolysis of the KCl + NaCl + ThF_4 melt. ThF_4 + 4NaCl(KCl) → Th + 4NaF-(KF) + $2Cl_2$. In proportion with the accumulation of fluorides of the alkali metals Th is bound in the complex, and for its deposition on the cathode a considerable increase is necessary in the concentration of Th in the electrolyte, up to 42 - 43 % by weight. The anodic process with an increase of fluorine content consists in the formation of CF_4: $NaK[ThF_6]$ + C → Th + NaF + KF + CF_4. Mean composition of the electrolytic Th (in % by weight): Th 99.5, Fe 0.005, rare earths 0.0006, Na 0.01, K 0.01, F 0.2, N 0.01, C 0.025, O 0.22. [Abstracter's note: Complete translation.]

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3/081/62/000/004/011/087
B149/B101

AUTHORS: Yemel'yanov, V. S., Yevstyukhin, A. I., Abanin, D. D., Statsenko, V. I.

TITLE: An improved method for the preparation of chromium by iodination and its properties

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 4, 1962, 94, abstract 4V8 (Sb."Metallurgiya i metalloved. chist. metallov". no. I. M., 1959, 44-62)

TEXT: A laboratory unit for the refining of chromium through its iodide has been developed; the ideal conditions and a diagram of the process have been determined. A comparative study has been carried out on the mechanical properties of the prepared chromium and of chromium remelted in an arc. The single crystals and the chromium remelted in an arc had a cubic body centered lattice with the parameter 2.8790±0.001 at room temperature. [Abstracter's note: Complete translation.]

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30659
S/137/61/000/010/009/056
A006/A101

5.2200 1067 1454,1521

AUTHORS: Yemel'yanov, V. S., Bystrov, P. D., Yevstyukhin, A. I.

TITLE: Production of plastic hafnium by the iodide method

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 10, 1961, 20, abstract 100153 (V sb. "Metallurgiya i metalloved. chist. metallov", no. 1, Moscow, 1959, 63 - 69)

TEXT: The authors studied the dependence of Hf precipitation rate on the temperature of the initial metal, the pressure in the retort, and the temperature of the filament. Hf precipitation was performed in a cylindrical Mo-glass retort of 18 - 20 cm length and 8 cm in diameter. The initial tungsten-filament of 0.05 mm in diameter and 8 cm length, was heated by a-c. The retort was heated in an electric resistance furnace. In all the experiments Hf rods were used as initial metal. The Hf was fourfold refined by the iodide method; the rods were about 2 mm in diameter and weighed 35 g. The iodine was introduced in the form of HfI in an amount of 1.5 g. The temperature of the filament was 1,350°C; the initial temperature of the retort was 355°C and attained 370 - 375°C at the end of the experiment. The experiments showed that the maximum rate of Hf precipitation

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Production of plastic hafnium by the iodide method

on the filament was attained at 230°C. The temperature of the raw metal affects the precipitation rate less than the pressure in the retort. The dependence of the Hf precipitation rate on temperature was investigated at 360°C in the retort and 230°C temperature of the ampoule with I_2. The rate of Hf precipitation increases under these conditions, but is considerably less than that of Zr precipitation.

O. Svodtseva

[Abstracter's note: Complete translation]

Card 2/2

31219
S/123/61/000/020/007/035
A004/A101

18.1272

AUTHORS: Yemel'yanov, V. S., Godin, Yu. G., Yevstyukhin, A. I.

TITLE: Mechanical properties of binary and ternary zirconium alloys with tantalum and niobium at room and high temperatures

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 20, 1961, 16, abstract 20A118 (V sb. "Metallurgiya i metalloved. chist. metallov", no. 1, Moscow, 1959, 128-143)

TEXT: The authors investigated the hardness and strength of cast and hardened Zr-alloys with Ta (0 - 100%) and Nb (0 - 20%) and also ternary alloys containing up to 18% Ta and Nb. The hardness (HR) was measured in an argon atmosphere. It was found that a maximum appeared on the composition - hardness and composition - strength curves which can be explained by the transformation of the β-phase into the α-phase. Alloying zirconium with Ta and Nb increases the strength and hardness at room and high temperatures. Up to 10% Nb strengthens Zr to a greater degree than the addition of Ta.

[Abstracter's note: Complete translation]

Card 1/1

KOROBKOV, I.I.; IGNAT'YEV, D.V.; YEVSTYUKHIN, A.I.; YEMEL'YANOV, V.S.

Electronographic and kinetic study of the oxidation process of zirconium and some zirconium-base alloys. Met.i metalloved. chist.met. no.1:144-161 '59. (MIRA 12:10)
(Zirconium--Metallography) (Electron Microscopy)

YEMEL'YANOV, V.S.; YEVSTYUKHIN, A.I.; GODIN, Yu.G.; RUSAKOV, A.A.

[Constitutional diagram of the system zirconium - beryllium] Diagramma sostoianiia sistemy tsirkonii-berillii. Moskva, Glav. upr. po ispol'zovaniiu atomnoi energii, 1960. 14 p. (MIRA 17:1)
(Zirconium-beryllium alloys--Metallography)
(Phase rule and equilibrium)

S/030/60/000/02/001/040
B008/B014

AUTHOR: Yemel'yanov, V. S., Corresponding Member of the AS USSR, Head of the Main Administration for the Use of Atomic Energy of the Council of Ministers of the USSR

TITLE: Close International Cooperation in the Field of Atomic Research

PERIODICAL: Vestnik Akademii nauk SSSR, 1960, Nr 2, pp 3-11 (USSR)

ABSTRACT: In this article the author discusses the problem of cooperation between scientists of various countries. The present stage of science and technology shows that large research programs cannot be carried out any longer by small teams and that important scientific problems can no longer be solved by one country alone. This applies especially to the problem of the use of atomic energy on the solution of which depends the future of mankind. The scientists of the Soviet Union and other countries who concentrate on the peaceful use of atomic energy are making great efforts to establish a fruitful basis for international cooperation which has already been started after the First Geneva Conference in 1955. Meanwhile Soviet scientists visited respective institutions and plants in France and Britain and invited French and British colleagues to

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Close International Cooperation in the Field of Atomic Research

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visit the Soviet Union. After N. S. Khrushchev's trip to the United States in 1959 possibilities have opened up for cooperation between American and Soviet scientists in the field of atomic research. The author reports on an eleven-day visit of American scientists to the Soviet Union in October, 1959, and on a 21-day visit of Soviet experts to the United States. In the course of these mutual visits scientists of the two countries were offered the opportunity of visiting atomic research centers and plants and of studying the present stage of research in both countries. However, it would also be useful to establish a permanent cooperation between the two countries as, e.g., for the erection of joint research centers and the construction of machines which involve high costs of investment, since research work is done in the same direction in both countries. Mention is made of P. A. Ponomarev, captain of the atomic icebreaker "Lenin", G. N. Flerov, N. V. Fedorenko, and Academician V. I. Veksler.

ASSOCIATION: Glavnoye upravleniye po ispol'zovaniyu atomnoy energii pri Sovete Ministrov SSSR (Main Administration for the Use of Atomic Energy of the Council of Ministers of the USSR)

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28058 S/137/61/000/004/004/039
A056/A101

18 3100

AUTHORS: Yemel'yanov, V.S., Yevstyukhin, A. I., Abanin, D. D.

TITLE: Iodide method of thorium refining

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1961, 33-34, abstract 4G269 (V sb. "Metallurgiya i metallovedeniye chistykh metallov no. 2 M., Atomizdat, 1960, 5-13)

TEXT: The initial material used for the refining was a powder of electrolytic Th of composition (in %): Th 99.5; O 0.22; F 0.20; Cl 0.002; N 0.025; C 0.030; Na 0.007; K 0.007; Fe 0.005; rare earths 0.0005. The precipitation process of Th on the wire was executed in a cylindrical flask of Mo-glass, 80 mm in diameter and 400 mm in length. The length of the incandescent wire was 600 - 700 mm. The flask was placed in a cylindrical furnace, heated to 400 - 450°C, and prepared for the refining process. To this purpose, the flask was heated in the furnace to 400°C. In the course of heating, at about 220 - 260°C, a iodide of Th was formed (ThI_4). At 400°C, the current was supplied to the heated wire. The temperature of the incandescent wire on which Th deposited was maintained at 1,200 - 1,300°C. The building up of the wire ended with an increase

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A056/A101

Iodide method of thorium refining

of I up to 50 - 70 amp. For the experiments, the flask was charged with 50 to 200 g of Th and 5 to 8 g of I_2. The thickness of the rods obtained in different experiments was 3.5 - 4 mm, weight 30 - 60 g. The composition (in %) of the non-molten ThI_4 rods was: Th 99.97; O < 0.01; N < 0.01; F < 0.01; C < 0.05; rare earths 0.0001.

G. S.

[Abstracter's note: Complete translation]

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YEMEL'YANOV, V.S.; YEVSTYUKHIN, A.I.; ABANIN, D.D.; STATSENKO, V.I.

Iodide method of refining chromium. Met. i metalloved. chist. no. 2:14-26 '60. (MIRA 13:12)
(Chromium--Metallurgy) (Iodides)

YEMEL'YANOV, V.S.; YEVSTYUKHIN, A.I.; LEONT'YEV, G.A.

Niobium iodide and some of its properties. Met. i metalloved. chist. met. no. 2:27-48 '60. (MIRA 13:12)
(Niobium iodide)

18.1215
18.9200

28306
S/081/61/000/016/012/040
B118/B101

AUTHORS: Yemel'yanov, V. S., Godin, Yu. G., Yevstyukhin, A. I.

TITLE: Preliminary investigation of the melts of the system zirconium - aluminum - beryllium

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 16, 1961, 53, abstract 16B365 (Sb. "Metallurgiya i metallovedeniye chistykh metallov". M., Atomizdat, no. 2, 1960, 58 - 77)

TEXT: Six sections of the system Zr - Al - Be were examined by the methods of thermal, metallographic, and X-ray analysis, and also by determination of the hardness. The samples were obtained by fusion in an arc furnace with a wear-resistant W electrode and a water-cooled copper crucible. Six hypothetical constitution diagrams were plotted on the basis of the data obtained. Three ternary compounds formed by peritectic reactions were found in the system $ZrBe_9$ - Zr_4Al_3: $4ZrBe_9 \cdot Zr_4Al_3$ (1380°C), $ZrBe_9 \cdot Zr_4Al_3$ (1330°C), and $ZrBe_9 \cdot 9Zr_4Al$ (1270°C). Zr_4Al_3 is soluble in $ZrBe_9$. The system $ZrBe_9$ - $ZrAl_2$ gives a diagram of the eutectic type

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B118/B101

Preliminary investigation of the...

(the eutectic $L \rightleftarrows ZrBe_9 + ZrBe_9 \cdot 9ZrAl_2$ at 1445°C and ~75% $ZrAl_2$). $ZrBe_9 \cdot 9ZrAl_2$ is formed by a peritectic reaction at 1465°C. Three ternary compounds were also found in the system $ZrBe_2$ - $ZrAl_2$: $ZrBe_2 \cdot 3ZrAl_2$ which is formed by a peritectic reaction (1415°C), $3ZrBe_2 \cdot ZrAl_2$ formed by a peritectic reaction (1340°C), and $4ZrBe_2 \cdot ZrAl_2$ formed by the peritectoid conversion $ZrBe_2 + 3ZrBe_2 \cdot ZrAl_2$ (1100°C). $ZrAl_2$ is soluble in $ZrBe_2$, and $ZrBe_2$ in $ZrAl_2$. Two intermediate phases are formed in the system $ZrBe_{13}$ - $ZrAl_3$ due to peritectic reactions: $2ZrBe_{13} \cdot ZrAl_3 \rightleftarrows L + ZrBe_{13} \cdot 13ZrAl_3$ (1190°C) and $ZrBe_{13} \cdot 13ZrAl_3 \rightleftarrows L + ZrAl_3$ (1250°C). $ZrAl_3$ is soluble in $ZrBe_{13}$. The system $ZrBe_{13}$ - Al gives a diagram of the eutectic type (eutectic at 635°C) with a limited solubility of Al in $ZrBe_{13}$. Three compounds formed by peritectic reactions were found in the system $ZrAl_3$ - Be: $ZrBeAl_3$, $ZrBe_7Al_3$, $ZrBe_{19}Al_3$, and the easily fusible eutectic $ZrAl_3Be_{19} + ZrAl_3Be_7$ (~35% Be and 635°C). [Abstracter's note:

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S/081/61/000/016/012/040
B118/B101

Preliminary investigation of the...

Complete translation.]

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82283

S/089/60/009/01/06/011
B014/B070

18.9200

AUTHORS: Yemel'yanov, V. S., Godin, Yu. G., Yevstyukhin, A. I., Rusakov, A. A.

TITLE: State Diagram of the Zirconium - Beryllium System

PERIODICAL: Atomnaya energiya, 1960, Vol. 9, No. 1, pp. 33-38

TEXT: As starting material for different alloys, zirconium iodide (purity 99.7% by weight) and distilled beryllium (purity 99.4% by weight) were used. The cast and annealed samples were investigated metallographically. The annealing temperature lay between 750°C and 1200°C and the annealing time between 250 and 35 hours. The samples were analyzed thermally in vacuum at a heating or cooling rate of 5 - 7°C per minute. For alloys containing 2.9, 5.04, and 8.9 per cent by weight of beryllium, critical points were determined. X-ray analyses (quantitative phase analysis) were made by photographic as well as ionization methods. The apparatus РКУ-86 (RKU-86) and УРС-50И (URS-50I) were used depending on the method. The microhardness was measured according to Rockwell by

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State Diagram of the Zirconium - Beryllium System

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B014/B070 82283

means of a diamond cone with a load of 15 kg. In the zirconium - beryllium system there are four intermediate phases: $ZrBe_2$, $ZrBe_6$, $ZrBe_9$, and $ZrBe_{12}$. The first three originate from peritectic reactions at 1235°C, 1475°C, and 1555°C. The last phase originates with an open maximum at 1645°C. At 965°C and a beryllium content of 5% there results an eutectic between $ZrBe_2$ and zirconium. An addition of beryllium to zirconium lowers the temperature of α-β transformation and leads to an eutectic at 800°C. The solubility of beryllium in α-zirconium is less than 0.1% by weight and in β-zirconium less than 0.3% by weight. The solubility of zirconium in beryllium does not exceed 0.3% by weight. There are 8 figures, 1 table, and 5 non-Soviet references.

SUBMITTED: February 3, 1960

Card 2/2

S/755/61/000/003/001/027

AUTHORS: Yevstyukhin, A.I., Yemel'yanov, V.S., Godin, Yu.G.

TITLE: Investigation of fused chloride-fluoride sodium, potassium, and zirconium systems.

SOURCE: Moscow. Inzhenerno-fizicheskiy institut. Metallurgiya i metallovedeniye chistykh metallov. no.3. 1961, 5-16.

TEXT: This paper is concerned with the fusions employed in the electrolytic preparation of Zr (cf., e.g., Steinberg, M. et al., J.Electrochem. Soc., v.101, no.2, 1954, 68-73) and reports the first preliminary results of the experimental investigation described in the title at the MIFI (Moscow Engineering Physics Institute). The experimental methodology was described previously by the 2 senior authors in Atomnaya energiya, no.4, 1956, 108-112, and no.5, 1956, 80-85. In essence, it comprises a thermal analysis of the fusions in a shielding atmosphere, an X-ray phase analysis, and a chemical analysis. It was quickly found that at high temperature (T) the binary system $NaCl-K_2ZrF_6$ (cf. Steinberg ref.) breaks down into a number of complex compounds; hence a study of the $KF-ZrF_4$ and $NaF-ZrF_4$ systems became mandatory. The $KF-ZrF_4$ phase diagram, investigated previously (1957) by the authors up to 33 mol-% ZrF_4, is now extended to 66 mol-% ZrF_4. The $NaF-ZrF_4$

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phase diagram published by Barton, C. et al. Phys. Chem. v.62, no.6, 1958, 665-676, is reproduced and interpreted in detail. The specific purpose of the currently begun investigation of the binary NaCl-K_3ZrF_7 is to clarify the many questions regarding the alterations of the composition of the initial NaCl-K_2ZrF_6, and especially the increasing stability of the resulting compounds and, hence, decreasing yield in pure Zr, with the progress of the electrolytic reaction in which K_3ZrF_7 is an intermediate product. Details of the preparation of the initial materials are explained: K_2ZrF_6 is precipitated from aqueous solutions, fractionally crystallized to reduce the Hf content to 0.05 wt.%, dewatered by remelt in an Ar atmosphere (in a Ni crucible), and comminuted in an agate mortar. Analytically pure KF was also remelted but was used in the form of small lumps, because comminution was rendered difficult by its hygroscopicity. KF and K_2ZrF_6 were mixed in stoichiometric proportions and fused in a Ni crucible under dry Ar. Any residual KF is readily selectively dissolved by water. The only thermally detectable effect occurs at 930°C. X-ray analysis reveals in it a face-centered cubic lattice with a = 8.969Å and discriminates it readily from KF and K_2ZrF_6. The analytically pure NaCl was dried for 12 hrs at 200°C and was comminuted in an agate mortar. The full range of NaCl-K_3ZrF_7 ratios was tested in both cooling and heating (near-full-page tabulation) at 3-5°C/min after 30-min holding in the molten state for homogenization. The first T halt is interpreted as corresponding to the precipitation of crystals of

the most refractory melt component, probably fluorides. The next halt, probably, is that of the crystallization of the chlorides. The third halt, evidently, is that of the crystallization of the eutectic and the peritectic reaction. No explanation is had for the 4th halt, which appeared in but two of the fusions explored. It could, possibly, be attributed to allotropic or other solid-phase transformations. The K_3ZrF_7 phase occurs in all fusions with up to 95 mol·% NaCl, but with a significant drop-off beyond 85 mol·%. The NaCl is in evidence in fusions with 100 to 75 mol·% NaCl, with a sharp drop-off below 75 mol·%. A new phase appears with NaCl from 30 to 85 mol·%, with a maximum at 50 mol·%, indicating the possible existence of a $K_3ZrF_7 \cdot NaCl$ chemical compound. Another, as yet unknown, phase is noted in alloys with 60 to 95 mol·% NaCl, with a maximum at 82.5 mol·%, which quantitative phase analysis identifies as the chemical compound $K_3ZrF_7 \cdot 5NaCl$. The $NaCl-K_3ZrF_7$ phase diagram constructed from these data is characterized by unlimited solubility of the components in the liquid state and the formation of chemical compounds in the solid state. $K_3ZrF_7 \cdot 5NaCl$ is formed by a peritectic reaction at 570°C; $K_3ZrF_7 \cdot NaCl$ is formed similarly at 600°. Eutectic point at 73 mol·% NaCl and 540°. The solid-state transformations regarded as less certain are tentatively plotted by broken lines. The results of a thermal analysis of the electrolytic bath originally consisting of $NaCl-K_2ZrF_6$ in correlation with the $NaCl-K_3ZrF_7$

phase diagram are tabulated. The same 3 temperature effects are detected. The results of a chemical and thermal analysis of the water-insoluble deposits in five electrolyte specimens are tabulated; the existence of K_3ZrF_7 is clearly identified. The mechanism of the electrolysis is reconstructed: From the initial electrolyte $NaCl-K_2ZrF_6$ Cl is evolved at the annode and a new component, NaF reacts with K_2ZrF_6, forming K_3ZrF_7, which dissociates forming the complex anions ZrF_7^{3-}, which, upon sufficient dechloridization of the electrolyte, discharge at the anode and form $2ZrF_7^{3-} + 6\,NaCl - 3e \rightarrow 2Na_3ZrF_7 + 3\,Cl_2$ (1), while at the cathode the complex anions dissociate delivering ultimately neutral Zr. Thus the summary reaction in a highly chloride-concentrated bath is $K_3ZrF_7 + 4NaCl \rightarrow Zr + 3KF + 4NaF + 2Cl_2$ and in chloride-deficient electrolyte $K_3ZrF_7 + C \rightarrow Zr + 3KF + CF_4$, the last compound of which is an anode product. There are 6 figures, 3 tables, and 8 references (6 Russian-language Soviet and the 2 English-language [illegible]

ASSOCIATION: MIFI Moscow Engineering Physics Institute

TITLE: The separation of zirconium and hafnium chlorides.

SOURCE: Moscow. Inzhenerno-fizicheskiy institut. Metallurgiya i metallovedeniye chistykh metallov. no.3. 1961, 17-26.

TEXT: The paper deals with the need for Hf-free Zr for nuclear-powerplant applications. The two elements were separated by selective reduction of their tetrachlorides by Zr and Al. Optimal separation procedures for lab use and the prerequisites for large-scale processing are set forth. One prime reason for the usefulness of Zr, namely, its small capture cross-section relative to thermal neutrons, is nullified by the presence of Hf with its 103-157 barn capture cross-section. The proposed method consists in the reduction of the Zr and Hf tetrachlorides into lower(tri- and di-) chlorides and their disproportionation (D) by heating. Three reactions are involved: (1) In the presence of an n-valent metallic or metalloidal reducer M, $nZr(Hf)Cl_4 + M \rightarrow nZr(Hf)Cl_3 + MCl_n$, wherein the reduction of $ZrCl_4$ proceeds more readily than that of $HfCl_4$. (2) upon heating, D occurs as $2Zr(Hf)Cl_3 \rightarrow Zr(Hf)Cl_2 + Zr(Hf)Cl_{(gas)4}$; and (3) both dichlorides are subject to D when heated as $2Zr(Hf)Cl_2 \rightleftharpoons Zr(Hf)Cl_4 + Zr(Hf)$, where the lower chlorides of Zr

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The separation of zirconium and hafnium chlorides. S/755/61/000/003/002/027

are more stable than those of Hf. The differences in reducibility and D of the Zr and Hf provide the basis for the separation process. Three successive operations must thus be performed to obtain $ZrCl_4$ with a small content of $HfCl_4$ and, ultimately, metallic Zr with a small Hf content. The preparation of the chlorides by a chlorination by CCl_4 of ZrO_2 and HfO_2 in a 100:1 ratio is described. The lab equipment has been previously described in the sbornik "Metallurgiya i metallovedeniya chistyky metallov," no.1, Izd-vo MIFI, 1959. The initial separation procedure in a 10^{-4}-torr vacuum, with the tetrachloride vapors passing over Zr shavings heated to 430°C, was found to be ineffective. In a second attempt, some 10-11 g intensely degassed Zr powder and a like amount of $ZrCl_4$ and $HfCl_4$ were held for 8 hrs at 400°C in a quartz ampule 30 mm diam and 100 mm long; upon completion of reduction and removal of the nonreduced chlorides, D of the trichlorides was performed in 3 hrs at 550° in the same ampules. The tetrachloride formed was continuously removed. The method reduced the $HfCl_4$ content from 4-5% in the nonreduced tetrachlorides to 0.2-0.3% in the $ZrCl_4$ after D of the trichlorides. The need for a rapid and more sensitive radiometric method prompted development of a method based on the use of radioactive Hf^{181}, which is described in detail. Optimal temperature and time relationships for the D were determined experimentally (third-step dichloride D in 16 hrs at 650°C). Experiments with Al as a metallic

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reducer met with trouble in the dichloride-D stage, because an Al-and-$AlCl_3$ fusion formed in which $ZrCl_2$ and $HfCl_2$ dissolved. The radiometric method of Hf-concentration determination is detailed. Upon completion of the optimal procedure, the $ZrCl_4$ contained only 0.029% $HfCl_4$; the final amount of $ZrCl_4$ constituted about 20% of the initial $ZrCl_4$ which contained 1% $HfCl_4$. The resulting metallic Zr was suitable for nuclear-powerplant applications. It is anticipated that an improvement in the reduction technique can result in a substantial improvement in the Zr-Hf separation ratio. One obvious improvement is the enlargement of the contact area between the tetrachloride with the Zr powder (the initially formed brown surface crust in the present procedure appears to inhibit such diffusion). A new lab equipment based on this consideration has been designed and built (cross-section shown). A quartz chamber contained a tree with tiered Zr trays, each covered with a thin layer of Zr or other reducer metal. Other suitable tray materials are Ni, stainless steel, etc. There are 4 figures, 2 tables, and 8 references (2 German and 6 English-language).

ASSOCIATION: MIFI (Moscow Engineering Physics Institute).

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S/755/61/000/003/012/027

AUTHORS: Yemel'yanov, V.S., Leont'yev, G.A., Yevstyukhin, A.I.

TITLE: Study of the process of iodide refining of niobium.

SOURCE: Moscow. Inzhenerno-fizicheskiy institut. Metallurgiya i metallovedeniye chistykh metallov. no.3. 1961, 127-136.

TEXT: The paper describes an experimental investigation of the iodide refining of Nb in the 350-700°C range, intended to explore the possible application to Nb of the van Arkel refining method. A literature survey mentions the low-T data given in no.2 of the present sbornik, 1960, 27, and the high-T data adduced by Chizhikov, D.M., and Grin'ko, A.M., in Akad. n. SSSR, Dokl., v.122, no. 22, 1958, 278, and by Rolsten, R., in J. Electrochem. Soc., v.106, no.11, 1959, 975. The findings of the latter are summarized extensively, together with the reactions postulated. The specific objective of the present investigation was a study of the precipitation process at raw-material T from 350-700°C and at various vapor pressures of the gaseous phase. The physical properties of the 4 iodides of Nb involved therein (di- through penta-) are taken from published literature. Experimental procedure: The thermal dissociation of the iodides was performed by van Arkel's method in a manner similar to that employed for the $MoCl_5$ (see p.142 of present sbornik,

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Study of the process of iodide refining of niobium. S/755/61/000/003/013/027

abstract S/755/61/000/003/013/027), but with the introduction of sublimated I into the apparatus. The precipitation rate was measured by the rate of accretion of the radius of the filament (mm) per unit time (min). The apparatus comprised a retort with an extension neck (cf. p. 141 of sbornik, abstr. cit.). Of the 3 test parameters (filament T, neck T, and retort T), 2 were held fixed and one was varied; the precipitated deposits on the walls of the apparatus were chemically analyzed. Details of the T regime of the various parts of the apparatus are given. Rod Nb, reduced to shavings, served as an initial material. The iodine was vacuum-sublimated twice and dehumidified and dechlorinated. Typical charges: 20 g Nb shavings degassed at 1,000°C and 1.59-2.46 g sublimated I. Precipitation rate vs. charge T and neck T: 61 tests were made. The filament T was maintained fixed at 900°C. At any one retort T up to 620° the precip. rate grows monotonically with increasing neck T; in these conditions NbI_3 is stable; at any one retort T 620° or higher the precip. rate exhibits a maximum in the 225-250° range; NbI_5 is then stable. The precip. rate with retort T of 650-700°C is $22.8 \cdot 10^{-3}$ mm/min under optimal conditions; this is 19-20 times the precip. rate at 350°. Microhardness of precipitated wire: The thickest wire made had a 2-mm diam. Microhardness (MH) tests with a 200-g load exhibited a highest MH of 240 kg/mm^2 in wire made at 600° retort T and 400-500°C neck T. Larger-scale tests were also made in the equipment described in no.2 of the present sbornik (1960). Chemical analyses tabulated show

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Study of the process of iodide refining of niobium. S/755/61/000/003/012/027

that the O and H content in the metallic iodide is a function of the precipitation process and increases with increasing neck T. There are 4 figures, 4 tables, and 11 references (4 Russian-language Soviet, 1 Russian translation of a presumably English-language paper, 1 French, and 5 English-language). G. V. Churin's participation in the study is acknowledged.

ASSOCIATION: MIFI (Moscow Engineering Physics Institute).

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S/755/61/000/003/013/027

AUTHORS: Yemel'yanov, V.S., Leont'yev, G.A., Yevstyukhin, A.I.

TITLE: Study of the process of thermal dissociation of molybdenum chlorides.

SOURCE: Moscow. Inzhenerno-fizicheskiy institut. Metallurgiya i metallovedeniye chistykh metallov. no.3. 1961, 137-151.

TEXT: The paper describes an extension of experimental work on the precipitation of Mo by thermal dissociation of $MoCl_5$ from the gaseous phase on a W filament core in a modified van Arkel apparatus (cf. no.1 of subject sbornik, MIPI, 1959, 70). The specific objective of the present work is a determination of the effect of the halide-vapor pressure in the retort, the temperature of the filament, and that of the initial, "raw," metal on the rate of growth of the wire. The properties of $MoCl_5$, $MoCl_4$, $MoCl_3$, and $MoCl_2$ are briefly summarized from existing standard Soviet and U.S. textbooks. Lathe-produced Mo shavings, de-ironed by hot-HCl treatment, washed in distilled water, dried at 110-120°C, and degassed at 1,000°C in a 10^{-4}-torr vacuum, was used as raw material. The chloridation equipment for the production of the $MoCl_5$ is described in no.2 of the present sbornik, Atomizdat, 1960, 55. The thermal-dissociation equipment is described (with 2 cross-sections). It comprises a glass retort with a filament holder and an

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extension neck through which the $MoCl_5$ is introduced from an ampoule. A current of up to 50 amp could be passed through the filaments for T-control purposes. The various types of glass employed at the various retort T's are specified. In all tests the neck T was lower than the retort T, so that excess $MoCl_5$ was precipitated in the neck and the required vapor pressure could be established in the apparatus by altering the neck T. The precipitation rate was determined by the rate of growth of the wire radius per unit time, as expressed in terms of the 2/3 power of the rate of change of the wire-heating current. The neck-T range investigated extended from 40 to 200°C. Two marked maxima were observed at neck T of 100 and 170°C. the T of the maxima remained the same for 3 combinations of retort T (300 and 400°) and filament T (1,300 and 1,400°). At a filament T of 1,400°C and an optimal neck T of 100° an ill-defined maximum occurred at retort T of 300-400°; within this T range low-volatility lower chlorides formed which interfered with the pyrometric determination of the filament T. The increasing growth rate with increasing retort T from 100 to 300°C is attributed to: (1) Accelerated reaction of the combination of the free Cl into $MoCl_5$ at the surface of the raw material, and (2) accelerated diffusion of the $MoCl_5$ thus formed toward the filament. Beyond a retort T of 300°C, the $MoCl_5$ begins to dissociate into $MoCl_3$, whereupon the partial pressure of the $MoCl_5$ decreases and the precipitation-growth rate diminishes. At a neck T of 100°C and retort T of 400 and 220° the growth rate increases steadily at

filament T from 1,100 to 1,700°C and is greater at a retort T of 400 than at 220°C. Summary of optimal process parameters: Filament T: 1,300-1,400°C; retort T: 300-400°C; neck T: 100 and 170°C. Microhardness of precipitate: 220-240 kg/mm^2. There are 10 figures, 3 tables, and 11 citations from 8 reference sources (4 Russian-language Soviet sources, 3 Russian translations of U.S. originals, and 1 English-language U.S. source). The participation of Engineer Ye. I. Timoshkin in the work is acknowledged.

ASSOCIATION: MIFI (Moscow Engineering Physics Institute).

S/755/61/000/003/026/027

AUTHORS: Godin, Yu. G., Yevstyukhin, A. I., Yemel'yanov, V. S., Rusakov, A. A., Suchkov, I. I.

TITLE: On the solubility of metals in carbon.

SOURCE: Moscow. Inzhenerno-fizicheskiy institut. Metallurgiya i metallovedeniye chistykh metallov. no.3. 1961, 284-289.

TEXT: The paper describes an attempt to determine the solubility of Zr and Nb in C, a task rendered difficult by the elevated m.p. of C (> 4,000°C) and its vapor pressure which, at the m.p., exceeds 100 at. A two-stage approach was chosen: (1) Determination of the possible existence of solubility; (2) determination of the limiting solubility, if any. The present paper describes the first-stage study for Zr and Nb. It was postulated that if one component is soluble in another, the amount of the dissolved component in an alloy quenched in the heterogeneous region of the phase diagram from the solidus T should correspond to the limiting content within the crystals of the dissolved component in accordance with the section rule. Separation of the crystals from the parent mass of the specimen would then permit analytical proof of the presence or absence of solubility and a determination of its magnitude, if any. Serious difficulties were encountered in the arc-melting preparation of Zr-C and Nb-C alloys because of the high volatility of C (beyond certain concentrations) at high T. Most of the alloys consisted of primary grains of "free" graphite and a eutectic consisting of a mixture of graphite and carbides of Zr or Nb, respectively. The pre-

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On the solubility of metals in carbon. S/755/61/000/003/026/027

paration of the C-Zr and C-Nb alloys in a MIFI-9-3 arc furnace in an atmosphere of Ar is described. Initial materials: Spectrally pure C sticks, iodide-Zr rods 99.8% pure, and lumps of Nb 99.3% pure. The charge was remelted several times to achieve uniform distribution. Separation of the crystals was performed either by gravity separation of the C from the carbides or by chemical dissolution of the carbides. Gravity separation was done on 270-mesh pulverized material. The liquid used was "bromophor" (Abstracter's note: Tetrabromoethane?) having a density of 2.8-2.9 g/cm^3. The graphite-carbide separation by centrifuging was not complete, which is attributed to a possibly inadequate comminution of the powder. In the chemical method, the 270-mesh powder was dissolved at high T in a Pt cup with a mix of HF and HNO_3. The carbides dissolved, the graphite did not. X-ray diffraction of the graphite was correlated with a like analysis of spectrally pure C. In pure graphite the 004 line alone is split, whereas in graphite separated from ZrC the 006 line is also split. A comparison of the interplane distance from the separated graphite with the values calculated per Nelson, et al., (Phys. Soc., Proc., v.57, 1945, 477) indicates so close a coincidence that the nonsolubility of Nb and Zr in graphite is regarded as established. A spectral analysis confirms that if there is any solubility at all, it must be less than 0.01%. There are 6 figures, 1 table, and 2 references (1 Russian-language Soviet and the above-cited English paper).

ASSOCIATION: MIFI (Moscow Engineering Physics Institute).

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S/025/61/000/007/002/004
D268/D304

AUTHOR: Yemel'yanov, V.S., Corresponding Member of the AS USSR, Chairman

TITLE: Nuclear synthesis

PERIODICAL: Nauka i zhizn', no. 7, 1961, 22-26

TEXT: The author explains the advantage of thermonuclear synthesis as a source of power and discusses the problems connected with harnessing it. Much Soviet research on controlled thermonuclear synthesis is carried out at the Institut atomnoy energii imeni I.V. Kurchatova AN USSR (Institute of Atomic Energy imeni I.V. Kurchatov, AS USSR) under the direction of Academician L.A. Artsimovich. Academician M.A. Leontovich plays a guiding role in work on theoretical problems. Important research is also carried out at the Fiziko-tekhnicheskiy institut (Physicotechnical Institute) in Leningrad, the Ukrainskiy fiziko-tekhnicheskiy institut (Ukrainian Physicotechnical Institute) and the Fiziko-tekhicheskiy institut AN Gruzinskoy SSR (Physicotechnical Institute, AS Gruzinskaya SSR), while individual problems are being studied by physicists at the Moskovskiy universitet

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Nuclear synthesis

(Moscow University). At the Leningrad Physicotechnical Institute, Academician B.P. Konstantinov is directing research on the "Alpha" toroidal thermonuclear installation. At the Institute of Atomic Energy, I.N. Golovin is directing work on "Ogra," the largest thermonuclear installation, which has magnetic plugs and is used to study the properties of plasma. There are 6 figures.

ASSOCIATION: Gosudarstvennyy komitet soveta ministrov SSSR po ispol'zovaniyu atomnoy energii (State Committee of the Council of Ministers USSR on the Uses of Atomic Energy)

YEMEL'YANOV, V.S.

Nucleonics and the building-up of communism. Atom. energ. 11 no.4:301-312 O '61. (MIRA 14:9)

1. Predsedatel' Gosudarstvennogo komiteta Soveta Ministrov SSSR po ispol'zovaniyu atomnoy energii.
(Nuclear research)

YEMEL'YANOV, V.S.

Atomic energy in marine transportation. Vest.AN SSSR 31 no.6: 57-66 Je '61. (MIRA 14:6)

1. Chlen-korrespondent AN SSSR, predsedatel' Gosudarstvennogo komiteta Soveta Ministrov SSSR po ispol'zovaniyu atomnoy energii. (Atomic ships)

YEMEL'YANOV, V.S.

Atomic science and technical progress. Vest. AN SSSR 31 no.10:22-28 O '61. (MIRA 14:9)

1. Chlen-korrespondent AN SSSR. (Nuclear physics)

YEMEL'YANOV, Vasiliy Semenovich; FAYNBOYM, I.B., red.; RAKITIN, I.T., tekhn. red.

[Responsibility of scientists]Ob otvetstvennosti uchenykh. Moskva, Izd-vo "Znanie," 1962. 37 p. (Novoe v zhizni, nauke, tekhnike. IX Seriia: Fizika i khimiia, no.21) (MIRA 15:11)
(Atomic weapons—International control) (Scientists)

S/828/62/000/000/004/017
E039/E420

AUTHORS: Yemel'yanov, V.S., Yevstyukhin, A.I., Barinov, I.P., Samonov, A.M.

TITLE: The separation of zirconium and hafnium by the selective reduction of their tetrachlorides by zirconium and aluminium

SOURCE: Razdeleniye blizkikh po svoystvam redkikh metallov. Mezhvuz. konfer. po metodam razdel. blizkikh po svoyst. red. metallov. Moscow, Metallurgizdat, 1962, 51-62

TEXT: Although Zr and Hf are separated on a commercial scale the present methods used are so cumbersome and difficult that the cost of the metals is high. This work is aimed at investigating a new and possibly more efficient method of separation. It is shown that the separation process involving the selective reduction of the tetrachlorides of Zr and Hf by Zr and Al is entirely feasible under laboratory conditions. Using powdered Zr as a reducing agent the maximum reduction of ZrCl is observed at 400°C and attains nearly 92% while for $HfCl_4$ maximum reduction occurs at 390°C and reaches 17%. When using powdered Al better separation is attained at a lower temperature than in the case of

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reduction by Zr. In the latter case the content of hafnium chloride in $ZrCl_3$ has a minimum value equal to 0.029% for a reduction temperature of 330°C. For the best conditions of reduction by Zr (at 400°C) the minimum quantities of hafnium chloride in $ZrCl_3$ are 0.108 and 0.13%. The quantity of $ZrCl_4$ reduced by Al at 330°C is, however, only 21% while for Zr at 400°C it is 91.7%. Reducing with Al at 400°C gives an 89% reduction and a hafnium chloride concentration in the $ZrCl_3$ of 0.091%. The data obtained confirms that this process can be performed on a large scale. There are 4 figures and 2 tables.

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S/826/62/000/000/003/007
D408/D307

5.4700

AUTHORS: Yevstyukhin, A.I., Yemel'yanov, V.S. and Godin, Yu.G.

TITLE: Investigation of melts of the chloride-fluoride system of sodium, potassium, and zirconium

SOURCE: Fizicheskaya khimiya rasplavlennykh soley i shlakov; trudy Vses. soveshch. po fiz. khimii raspl. soley i shlakov, 22 - 25 noyabrya 1960 g., Moscow. Metallurgizdat, 1962, 63 - 71

TEXT: Results of an investigation of the binary system NaCl--K_3ZrF_7, and its behavior under electrolysis, are given. It was assumed that these systems possess many common features and that the study of one system would facilitate the understanding of the others. The raw materials used for the investigation were KF, NaCl and K_2ZrF_6, the latter being precipitated from aqueous solution whereby the hafnium content was reduced to 0.05 % by the method of fractional crystallization. K_3ZrF_7 was prepared by fusing together stoichiometric quantities of KF and K_2ZrF_6 under argon.

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S/826/62/000/000/003/007
D408/D307

Investigation of melts ...

Thermal analysis of 25 samples of the binary system, containing 100 - 0 % K_3ZrF_7, was carried out mainly by the cooling curve method, the heating curve method being used in a few cases. Up to four inflection points were found in each thermogram, the first two inflections corresponding to the separation of fluoride and chloride crystals respectively, and the third to the crystallization of a eutectic or a peritectic reaction point. The fourth inflection, observed for only two of the melts, possibly indicated an allotropic or other solid phase transformation. X-ray analysis showed that all melts containing up to 95 mol.% NaCl possessed the K_3ZrF_7 phase, and the NaCl phase was present in melts containing 100 - 75 mol.% NaCl. A new phase, K_3ZrF_7.NaCl, and a previously unknown phase, K_3ZrF_7.5NaCl, were detected in melts containing 30-85 and 60-95 mol.% NaCl respectively. The phase diagram of the NaCl--K_3ZrF_7 system was constructed; this showed that K_3ZrF_7.NaCl and K_3ZrF_7.5NaCl from through peritectic reactions at 570 and 600°C respectively, and that a eutectic occurs at 73 mol.% NaCl and 540°C. The water-insoluble residues of electrolyte samples, taken from an electrolytic cell, were shown to be K_3ZrF_7. From the results of this

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and other work, the authors suggest a mechanism for the electrolytic production of zirconium from fluoride-chloride melts, the overall reactions being: a) with a sufficiently high concentration of chloride in the electrolyte

$$K_3ZrF_7 + 4NaCl \longrightarrow Zr + 3KF + 4NaF + 2Cl_2;$$

and b) in an electrolyte very defficient in chloride

$$K_3ZrF_7 + C \longrightarrow Zr + 3KF + CF_4.$$

Both reactions occur simultaneously with moderate concentrations of chloride in the electrolyte. There are 6 figures and 3 tables.

ASSOCIATION: Moskovskiy inzhenerno-fizicheskiy institut
(Moscow Engineering Physics Institute)

YEMELYANOV V.S

JEMELJANOV, V. S.

Atomic science and technology and the building up of communism. Jaderna energie 8 no.1:2-8 Ja '62.

1. Predseda Statniho vyboru pro vyuziti jaderne energie pri rade ministru SSSR.

YEMEL'YANOV, V.

JAMIELIANOW, W.

Production of power in the future. Przegl techn no.45:1-5 11 N '62

1. Czlonek-korespondent Akademii Nauk ZSRR.

YEMEL'YANOV, V.S.

Atomic science and engineering in Hungary. Vest.AN SSSR 32 no.8:82-84 Ag '62. (MIRA 15:8)

1. Chlen-korrespondent AN SSSR.
(Hungary—Atomic engery research)

YEMEL'YANOV, V.S.

Cooperation between Soviet and Czech atomic scientists.
Vest. AN SSSR 32 no.11:110-113 N '62. (MIRA 15:11)

1. Chlen-korrespondent AN SSSR.
(Czechoslovakia—Atomic power plants)
(Czechoslovakia—Technical assistance, Russian)

ACCESSION NR: AT4005956 S/2755/63/000/004/0005/0010

AUTHOR: Yemel'yanov, V. S.; Yevstyukhin, A. I., Abanin, D. D.

TITLE: Iodide method of zirconium refining

SOURCE: Moscow. Inzhenerno-fizicheskiy institut. Metallurgiya i metallovedeniye chisty*kh metallov, no. 4, 1963, 5-10

TOPIC TAGS: zirconium refining, zirconium purification, iodide zirconium, high purity zirconium, iodide refining method

ABSTRACT: The authors investigated the mechanism of the transfer of nonmetallic impurities to the filament during iodide refining of zirconium, as well as the effect of degasification on this transfer, and developed a technique for producing highly purified Zr in a single-stage process. The iodide precipitation of Zr was carried out in a Mo-glass refining vessel with Mo electrodes and a tungsten filament (0.05 mm in diameter). Preliminary degasification was carried out in a quartz sidearm at 10^{-4} mm Hg and an optimal temperature of 850-950C. Subsequent iodide refining was carried out at 300-320C with a filament temperature of 1200-1300C. The Zr obtained by this method was characterized by a marked reduction in the content of O_2 and H_2 (0.002 and 0.0004%)

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